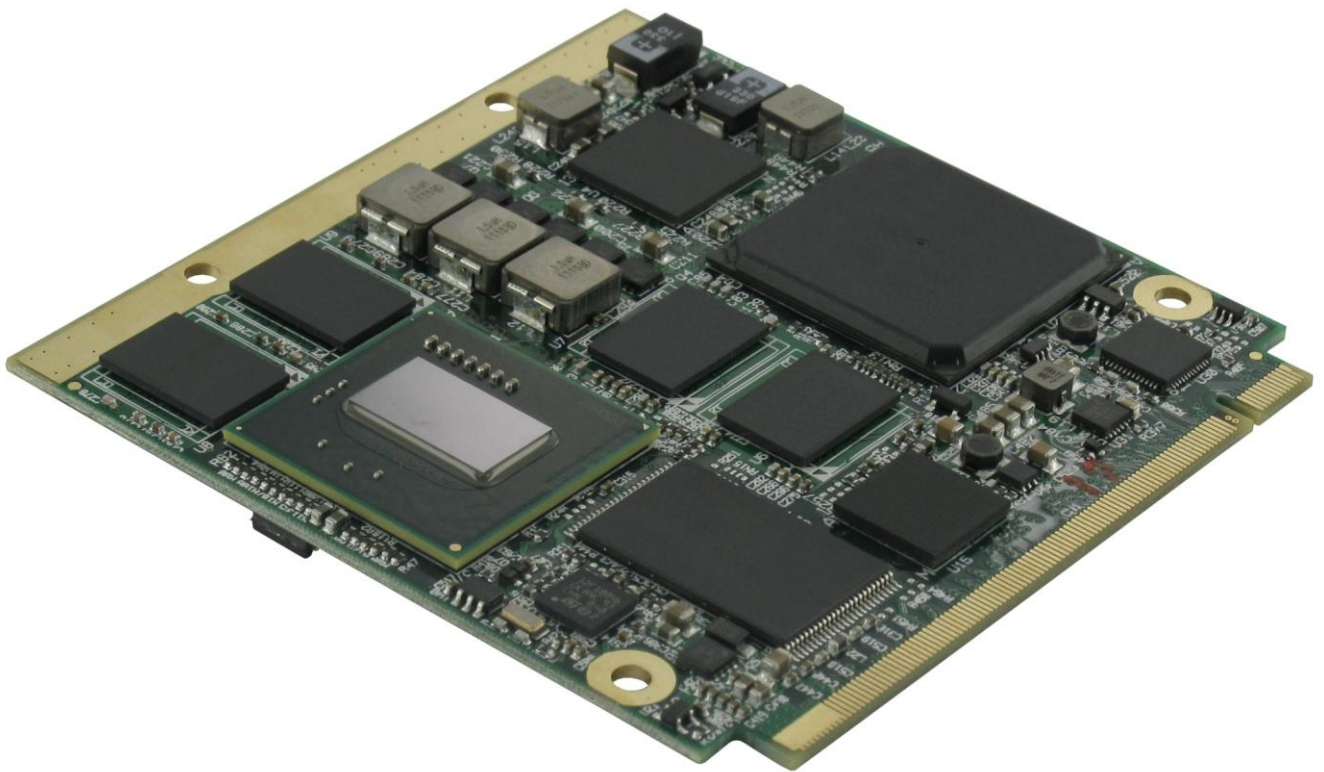


# QUADMO747-E6xx

Qseven® Rel. 1.20 Compliant Module with Intel® Atom™ E6xx series CPU

**EXTREME**



*User Manual*



QUADMO747-E6xx

## REVISION HISTORY

Revision	Date	Note	Rif.
1.0	27 <sup>th</sup> December 2011	First official release	SB
1.1	14 <sup>th</sup> September 2012	BIOS section updated	SB
1.2	19 <sup>th</sup> November 2012	BIOS section updated; board's pictures updated	SB

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For further information as regards this module or other SECO products please visit our websites at <http://www.seco.com> and <http://www.secoqseven.com>.

Moreover in order to have the proper assistance for any possible issue please complete your registration online on our specific website for Qseven® modules (<http://www.secoqseven.com>).

Our team will be pleased and ready to assist you.

SECO Srl - Via Calamandrei 91  
52100 Arezzo – ITALY  
Ph: +39 0575 26979 - Fax: +39 0575 350210  
<http://www.seco.com>  
<http://www.secoqseven.com>



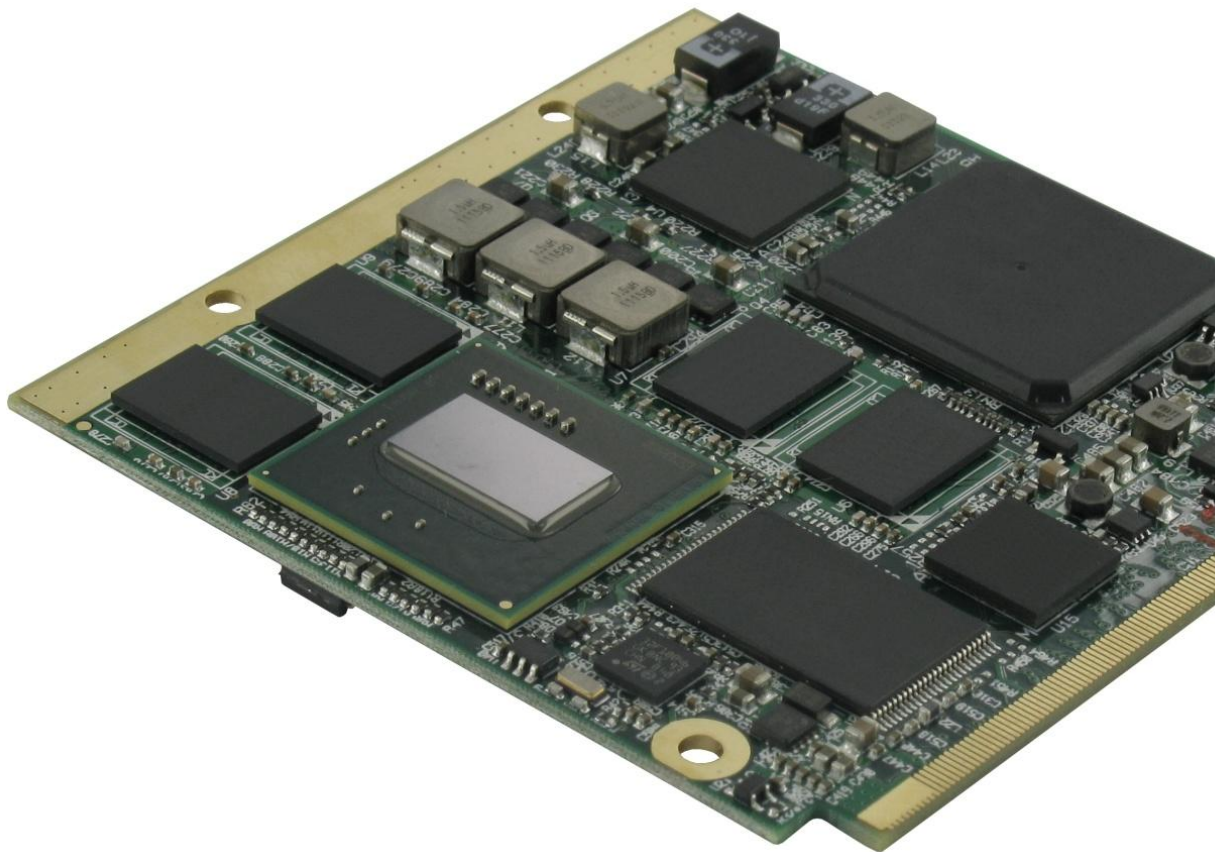
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# ***Chapter 1. INTRODUCTION***

- **Warranty**
- **Information and assistance**
- **RMA number request**
- **Safety**
- **Electrostatic Discharges**
- **RoHS compliance**



## 1.1 Warranty

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This product is subject to Italian law D. Lgs 24/2002, acting European Directive 1999/44/CE on arguments of sale and warranties to consumer.

The warranty for this product lasts 1 year.

Under the warranty period the Supplier guarantees the buyer an assistance service for repairing, replacing or credit of the item, at its own discretion.

Shipping costs regarding non-conforming items or items that need replacement are to be paid by the customer.

Items cannot be returned unless formerly authorised by the supplier.

The authorisation is released after compiling the specific form available from the web-site <http://www.seco.com> (RMA Online). Authorisation number for returning the item must be put both on the packaging and on the documents brought with the items, which have to be not damaged, not tampered, with all accessories in their original packaging.

Error analysis form identifying the fault type has to be compiled by the customer and has to be sent in the packaging of the returned item.

If some of the above mentioned requirements for returning the item are not satisfied, item will be shipped back and customer will have to pay for shipping costs.

The supplier, after a technical analysis, will verify if all the requirements for warranty service are met. If warranty cannot be applied, he calculates the minimum cost of this initial analysis on the item and the repairing costs. Costs for replaced components will be calculated aside.

### Warning!



*All changes or modifications to the equipment not clearly approved by SECO S.r.l. could impair equipment's functionality and lead to the expire of the warranty*

## 1.2 Information and assistance

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What do I have to do if the product is faulty?

SECO S.r.l. offers the following services:

- SECO website: visit <http://www.secoqseven.com> to receive the last information on the product. In most of the cases you can find useful information to resolve your problem.

Visit also [www.seco.com](http://www.seco.com) for FAQ Section and Support requests for registered users.

- SECO reseller: the reseller or agent can help you in determining the exact cause of the problem and search the best solution for it.
- SECO Help-Desk: contact SECO Technical Assistance.

A technician is at your disposal to understand the exact origin of the problem and suggest the right solution.

E-mail: [technical.service@seco.com](mailto:technical.service@seco.com)

Fax (+39) 0575 340434

- Repairing centre: it is possible to send the faulty product to SECO Repairing Centre. In this case, follow this procedure:
  - Returned items have to be provided with RMA Number. Items sent without RMA number will be not accepted.
  - Returned items have to be packed in the appropriate manner. SECO is not responsible for damages caused by accidental drop, improper usage, or customer neglects.

Note: We ask to prepare the following information before asking for technical assistance:

- Name and serial number of the product;
- Description of Customer's peripheral connections;
- Description of Customer's software (operative system, version, application software, etc.);
- A complete description of the problem;
- The exact words of every kind of error message received

## 1.3 RMA number request

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To request a RMA number, please, visit SECO's web-site. In the home-page select "RMA Online" and follow the described procedure

You will receive an RMA Number within 1 working day (only for on-line RMA request).



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## 1.4 Safety

Quadmo747-E6xx modules only use extremely-low voltages.

While handling the board, it is necessary to be careful in order to avoid any kind of risk or damages to electronic components. Always switch the power off, and unplug the power supply unit, before handling the board and/or connecting cables or other boards.

Don't use metallic components, like paper clips, screws and similar, near the board, when this is supplied, to avoid short circuits due to unwanted contacts with other components of the board.

Never connect the board to an external power supply unit or battery, if the board has become wet.

Make sure that all cables are correctly connected and are not damaged.

---

## 1.5 Electrostatic Discharges

Quadmo747-E6xx, like any other electronic product, is an electrostatic sensitive device and some device on-board could be damaged by high voltages caused by static electricity.

So whenever handling a Quadmo747-E6xx board, take care to ground yourself through an anti-static wrist strap. Placement of the board on an anti-static surface is also highly recommended.

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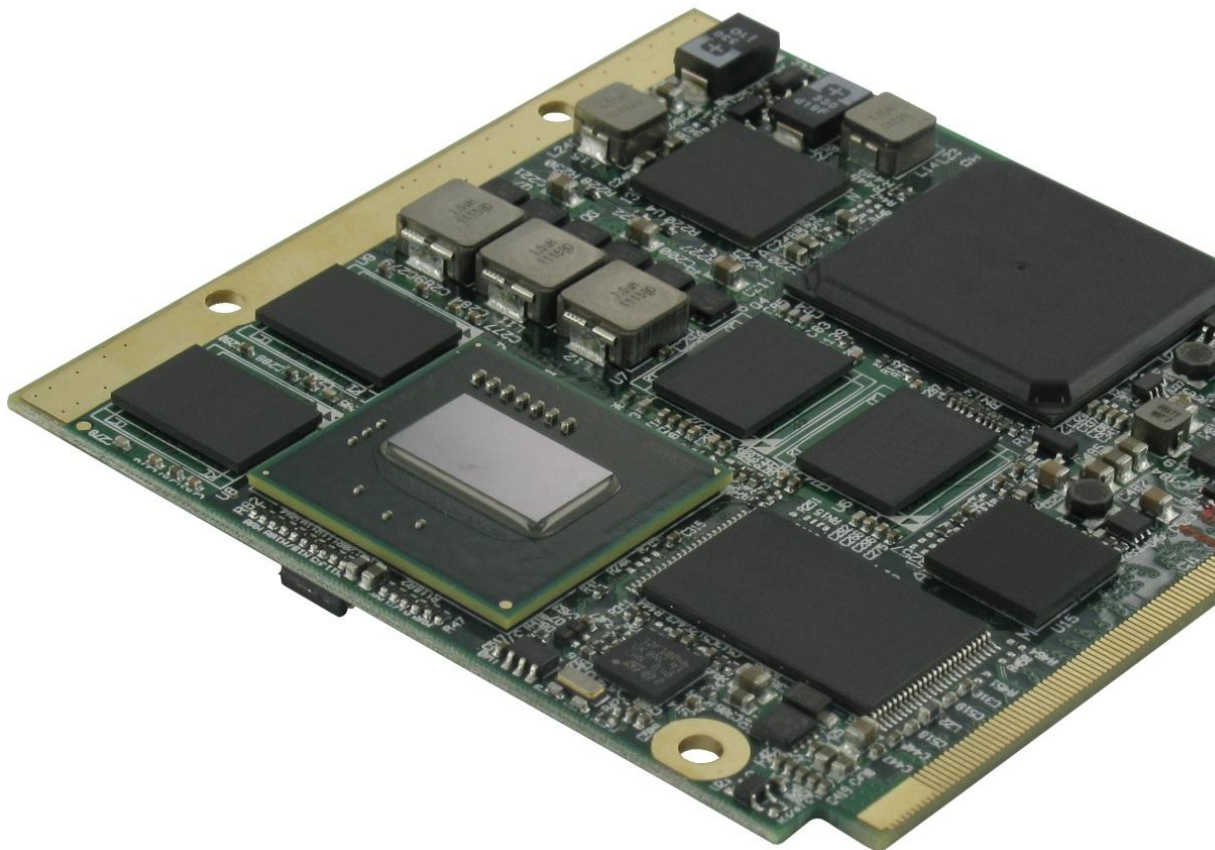
## 1.6 RoHS compliance

Quadmo747-E6xx boards are designed using RoHS compliant components and are manufactured on a lead-free production line. They are therefore fully RoHS compliant.



# ***Chapter 2. OVERVIEW***

- **Introduction**
- **Technical Specifications**
- **Electrical specifications**
- **Mechanical specifications**
- **Block diagram**



## 2.1 Introduction

Quadmo747-E6xx is a CPU module, in new Qseven<sup>®</sup> format, based on Intel<sup>®</sup> Atom<sup>™</sup> E6xx series CPU, interfaced to Intel<sup>®</sup> EG20T Platform Control Hub.

This high level of integration allows an extremely reduced consumption of spaces, that is essential for boards with sizes so reduced as for Qseven<sup>®</sup> boards, which offers all functionalities of standard PC boards in just 70x70mm.

Many CPUs are available for Quadmo747-E6xx module, ranging from 600MHz to 1.6GHz. All CPU's available have a 512KB L2 cache, and a TDP (Thermal Dissipation Power) between 3.3W and 4.5W, so that global power consumption of the board can be limited. Moreover, all CPU offer dual Thread capabilities.

Intel<sup>®</sup> Atom<sup>™</sup> E6xx CPU series include many features that were usually included in external Chipsets (Northbridge and Southbridge): an advanced 2D and 3D graphic accelerator, HD Audio interface, the memory controller, the PCI Express interface (4 lanes x1), one SPI interface, LPC Bus interface and SM Bus. From CPU's integrated 2D/3D Graphic Media Accelerator, the LVDS and SDVO interfaces are directly carried out to the golden finger card edge connector.

Communications between CPU and PCH comes through the Hi-Speed PCI Express lane #0 managed directly by the CPU.

The Platform Controller Hub completes the already rich list of features offered by the CPU, making available two SATA channels, a CAN interface, 6 USB 2.0 Host ports and one USB Client port, one SDI/O interface, I2C Bus and another SPI interface (different than the one offered by the CPU), which is carried out directly on the Qseven<sup>®</sup> golden finger connector.

The board is completed with up to 2GB DDR2 directly soldered on board, and one SATA Flash Disk, directly accessible like any standard Hard Disk, with up to 32GB of capacity. The internal SATA Flash Disk is alternative to second SATA Channel carried out on Qseven<sup>®</sup> golden finger.

Interfaced to CPU's PCI Express lane #3, there is a Gigabit Ethernet Controller. It is used this external GbE controller instead of PCH internal controller in order to offer more bandwidth. Depending on the version of the board (Commercial or Extreme), the Gigabit Ethernet controller used can be Realtek RTL811E (commercial version) or Intel<sup>®</sup> WG82574IT (Extreme version).

Interfacing to the board comes through a single card edge connector, as defined by Qseven<sup>®</sup> specifications, where are carried out all interfaces previously described. For external interfacing to standard devices, a carrier board with a 230-pin MXM connector is needed. This board will implement all the routing of the interface signals to external standard connectors, as well as integration of other peripherals/devices not already included in Quadmo747-E6xx CPU module.

All CPU of E6xx family are available both in commercial temperature range (0 ÷ 70°C) and industrial temperature range (-40°C ÷ +85°C). It is possible to have an EXTREME version of the board, where all the components mounted onboard are certified to work in industrial range, therefore the board is specifically developed to work in range -40°C ÷ +85°C.

For thermal dissipation of the board, according to Qseven<sup>®</sup> specifications, it is contemplated the use of an application specific heatspreader, that is fixed to the board and get in touch with surfaces at higher temperature, like CPU core. For better thermal distribution, on top and bottom side of Quadmo747-E6xx modules there is a metallised strip free of components, opposite to card edge, which goes in direct contact with the heatspreader, to increment the surface used for thermal exchange.

Standard heatspreaders/heatsinks for Quadmo747-E6xx module are available from SECO, however, thermal dissipation need to be specifically studied within the whole system.

To learn more about Qseven<sup>®</sup> standard: <http://www.qseven-standard.org>.

More information about SECO Qseven products is available at <http://www.secoqseven.com>.

## 2.2 Technical Specifications

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- **CPU:** Intel® Atom™ E620/E620T @ 600MHz, 3.3W TDP  
Intel® Atom™ E640/E640T @ 1.0GHz, 3.6W TDP  
Intel® Atom™ E660/E660T @ 1.3GHz, 3.6W TDP  
Intel® Atom™ E680/E680T @ 1.6GHz, 4.5W TDP
- **Platform Controller Hub:** Intel® PCH EG20T
- **Memory:** Up to 2GB DDR2 800 MHz onboard
- **Graphic controller:** integrated Intel® GMA 500  
Dual independent display support  
MPEG2, MPEG4, H.264, DivX HW video decoding
- **Graphic Interface:** Single Channel LVDS interface, at 18 or 24 bit  
SDVO interface  
Maximum resolution 1280x768 on LVDS  
Maximum resolution 1920x1080 on SDVO
- **Mass Storage:** Up to 2 x External S-ATA Channels  
Optional onboard SATA Flash Disk up to 32 GB \*  
2 x Express Card interface  
SD/MMC/SDIO interface
- **PCI Express:** 2 x PCI-e x1 lanes
- **USB:** 6 x USB 2.0 Host ports  
1 x USB client port
- **Ethernet:** Realtek RTL8111E Gigabit Eth. controller, (Commercial Version)  
Intel® WG82574IT Gigabit Eth. controller (Extreme Version)
- **AUDIO:** HD Audio interface
- **CAN Interface**
- **I2C Bus**
- **LPC Bus**
- **SMBus**
- **SPI Bus**
- **FAN Management**
- **Power Management Signals**
- **Power supply voltage:** 5V +/-5%
- **Operating temperature:** 0°C ÷ +60°C Commercial version \*\*  
-40°C ÷ +85°C **EXTREME** version \*\*
- **Dimensions:** 70 x 70 mm (2.756 x 2.756)

\* Please consider that for HDD and Flash Disk manufacturers, 1GB = 10<sup>9</sup> Byte. Some OS (like, for example, Windows) intends 1GB = 1024<sup>3</sup> byte, so global capacity shown for Disk Properties will be less than expected. Please also consider that part of disk capacity will be used by internal Flash Controller for Disk management, so final capacity will be lower.

\*\* Temperature indicated is the maximum temperature that the heatspreader can reach in any of its parts. This means that it is customer's responsibility to connect the standard heatspreader to an application-dependent cooling system, capable to ensure that the heatspreader temperature remains in the range indicated. In case the customer don't uses standard heatspreaders supplied by SECO, it is his own and sole responsibility to check that and module's section remain in the allowed range for the components.

## 2.3 Electrical specifications

Quadmo747-E6xx boards need to be supplied only with an external  $+5V_{DC}$  power supply.

For working in ATX mode, also  $+5V_{SB}$  voltage needs to be supplied.

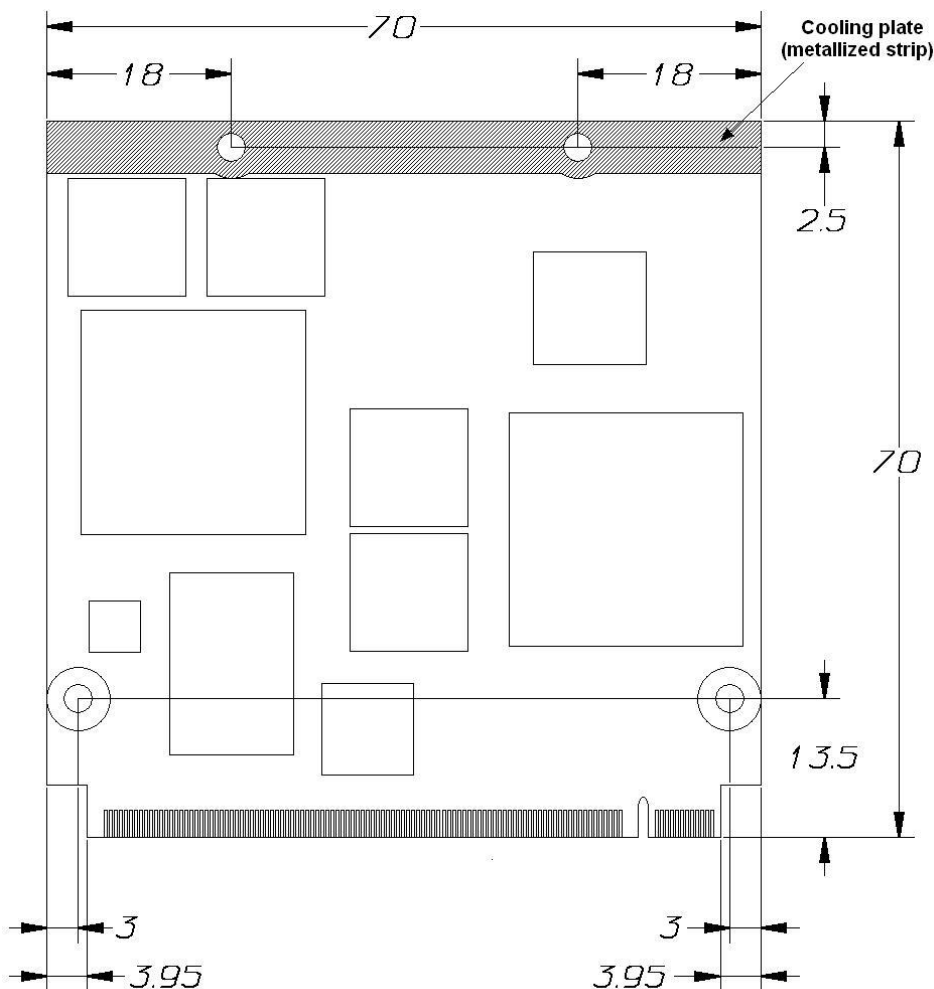
For Real Time Clock working and CMOS memory data retention, it is also needed a backup battery voltage. All these voltages are supplied directly through card edge fingers (see connector's pinout).

All remaining voltages needed for board's working are generated internally from  $+5V_{DC}$  power rail.

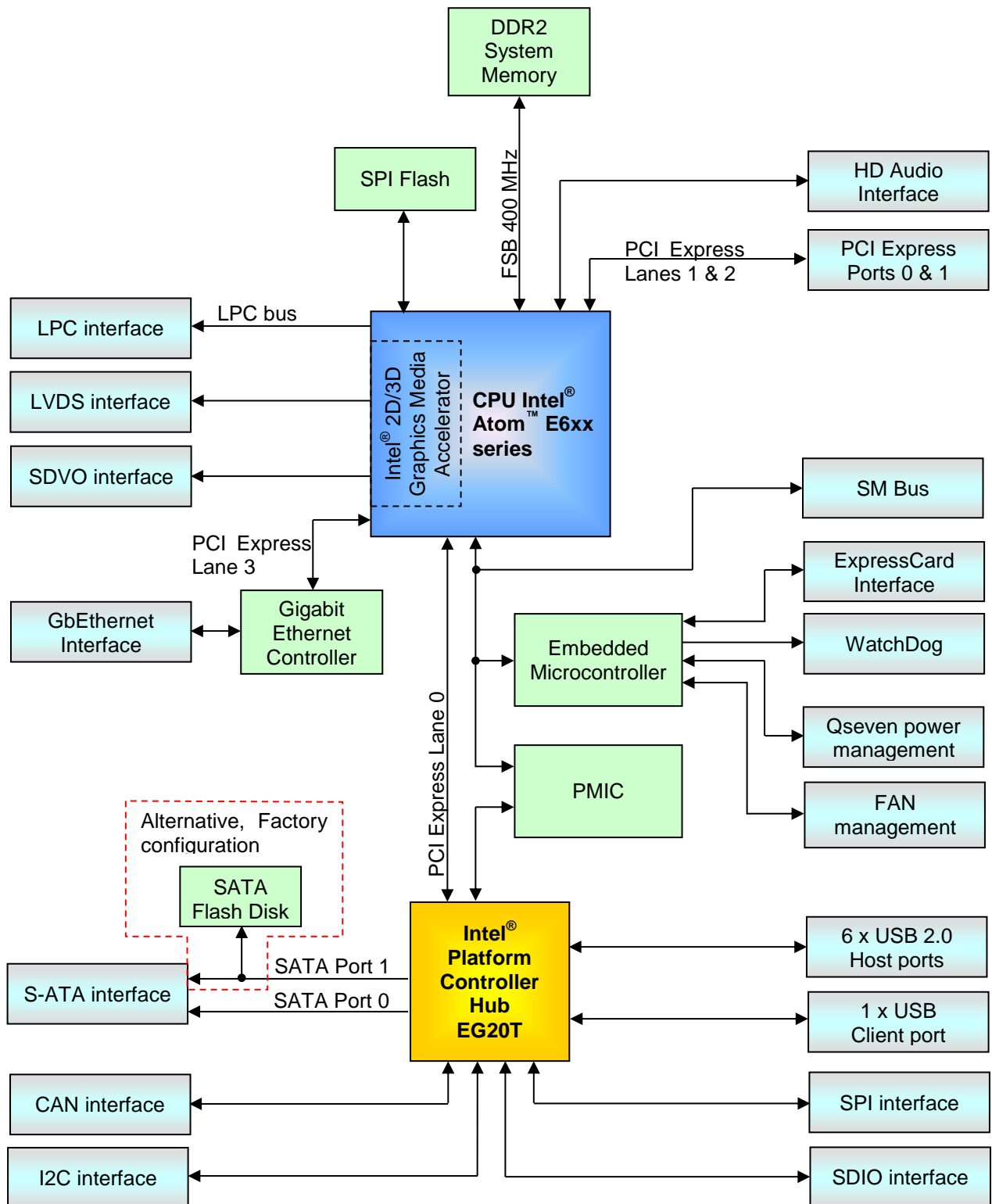
## 2.4 Mechanical specifications

According to Qseven<sup>®</sup> specifications, board dimensions are: 70 x 70 mm (2.756" x 2.756").

Printed circuit of the board is made of twelve layers, some of them are ground planes, for disturbance rejection.



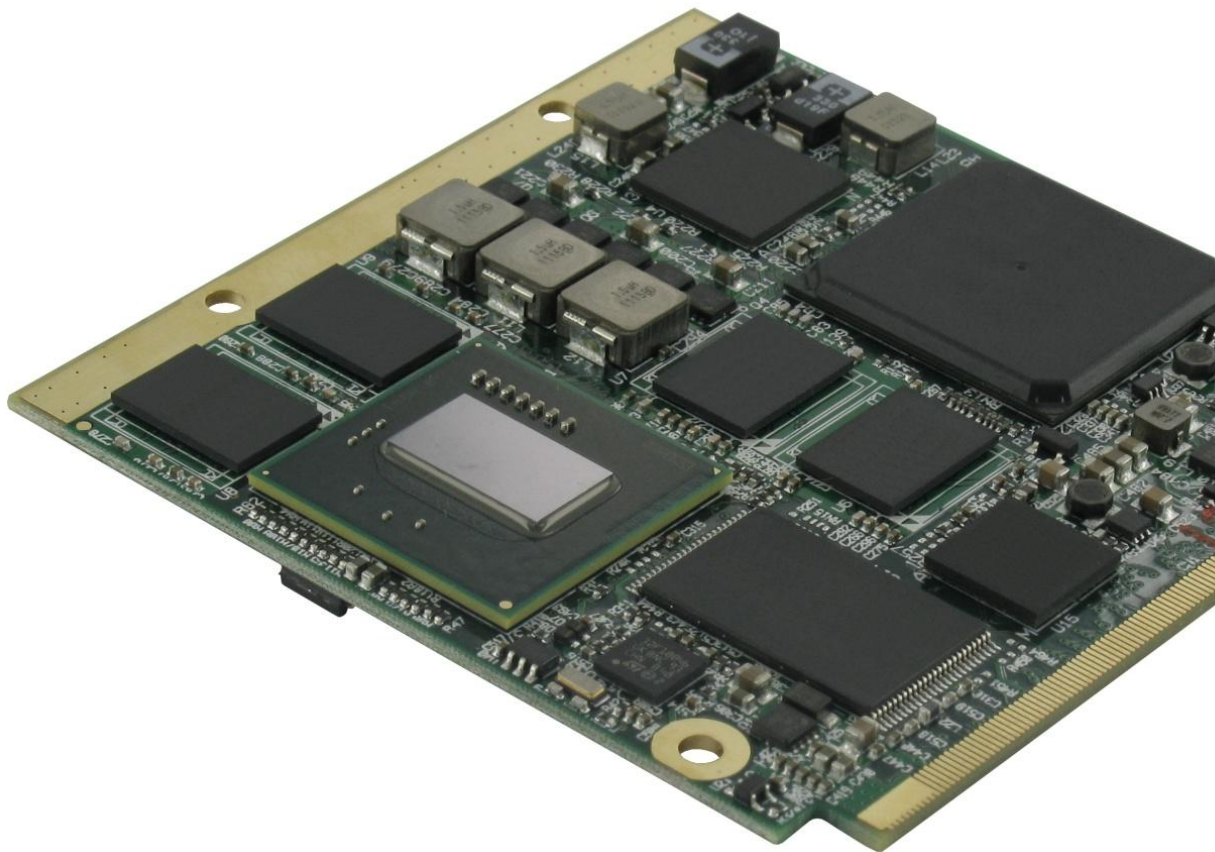
## 2.5 Block diagram





# ***Chapter 3. CONNECTORS***

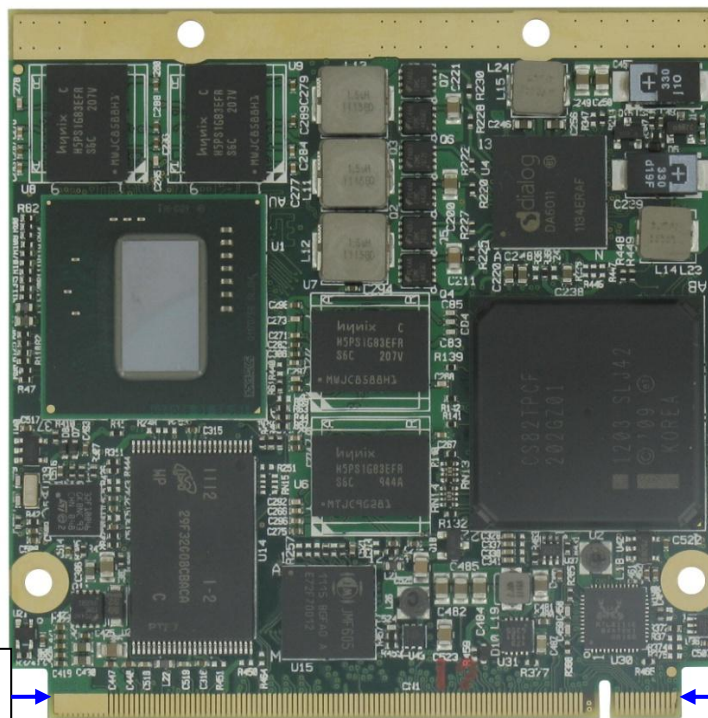
- **Connectors overview**
- **Connectors description**



### 3.1 Connectors overview

According to Qseven<sup>®</sup> specifications, all interfaces to the board are available through a single card edge connector.

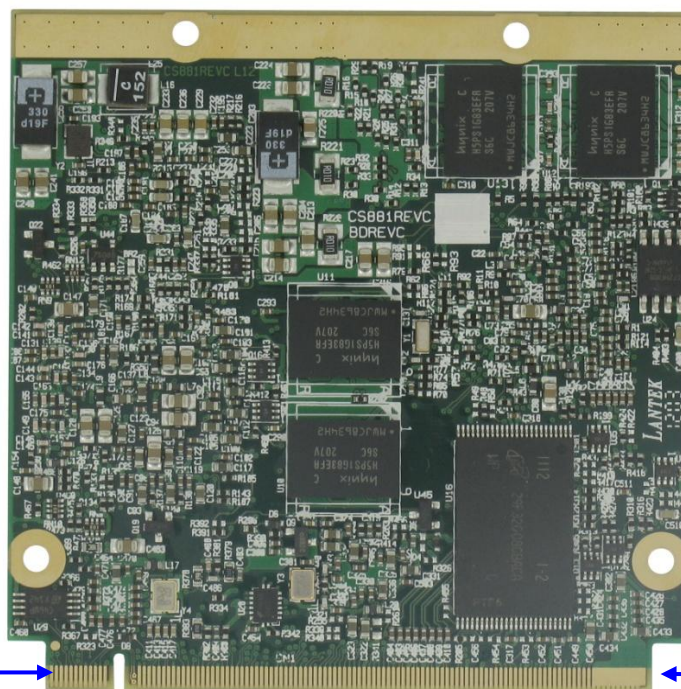
Top side



Card edge golden fingers, pin 228

Card edge golden fingers, pin 2

Bottom side



Card edge golden fingers, pin 1

Card edge golden fingers, pin 229



## 3.2 Connectors description

### 3.2.1 Qseven® Connector

According to Qseven® specifications, all interface signals are reported on the card edge connector, which is a 230-pin Card Edge that can be inserted into standard MXM connectors, as described in Qseven® specifications.

Not all signals contemplated in Qseven® standard are implemented on MXM connector, due to the functionalities really implemented on Quadmo747-E6xx CPU module. Therefore, please refer to the following table for a list of effective signals reported on MXM connector.

For accurate signals description, please consult Qseven® specifications.

NOTE: Even pins are available on top side of CPU board; odd pins are available on bottom side of CPU board. Please refer to board photos.

Card Edge Golden Fingers - CN1			
Pin	Signal	Pin	Signal
1	GND	2	GND
3	GBE_MDI3-	4	GBE_MDI2-
5	GBE_MDI3+	6	GBE_MDI2+
7	GBE_LINK100#	8	GBE_LINK1000#
9	GBE_MDI1-	10	GBE_MDI0-
11	GBE_MDI1+	12	GBE_MDI0+
13	GBE_LINK#	14	GBE_ACT#
15	---	16	SUS_S5#
17	WAKE#	18	SUS_S3#
19	SUS_S3#	20	PWRBTN#
21	SLP_BTN#	22	LID_BTN#
23	GND	24	GND
25	GND	26	PWGIN
27	BAT_LOW#	28	RSTBTN#
29	SATA0_TX+	30	SATA1_TX+
31	SATA0_TX-	32	SATA1_TX-
33	SATA_ACT#	34	GND
35	SATA0_RX+	36	SATA1_RX+
37	SATA0_RX-	38	SATA1_RX-
39	GND	40	GND
41	---	42	SDIO_CLK#
43	SDIO_CD#	44	SDIO_LED
45	SDIO_CMD	46	SDIO_WP
47	SDIO_PWR#	48	SDIO_DAT1
49	SDIO_DAT0	50	SDIO_DAT3
51	SDIO_DAT2	52	SDIO_DAT5
53	SDIO_DAT4	54	SDIO_DAT7
55	SDIO_DAT6	56	HDA_SDI1
57	GND	58	GND
59	HDA_SYNC	60	SMB_CLK
61	HDA_RST#	62	SMB_DAT

63	HDA_BITCLK	64	SMB_ALERT#
65	HDA_SDIO	66	I2C_CLK
67	HDA_SDO	68	I2C_DAT
69	THRM#	70	WDTRIG#
71	THRMTRIP#	72	WDOUT
73	GND	74	GND
75	---	76	USP_P6-
77	---	78	USP_P6+
79	---	80	USB_4_5_OC#
81	USB_P5-	82	USB_P4-
83	USB_P5+	84	USB_P4+
85	USB_2_3_OC#	86	USB_0_1_OC#
87	USB_P3-	88	USB_P2-
89	USB_P3+	90	USB_P2+
91	GPIO5	92	USB_ID
93	USB_P1-	94	USB_P0-
95	USB_P1+	96	USB_P0+
97	GND	98	GND
99	LVDS_A0+	100	---
101	LVDS_A0-	102	---
103	LVDS_A1+	104	---
105	LVDS_A1-	106	---
107	LVDS_A2+	108	---
109	LVDS_A2-	110	---
111	LVDS_PPEN	112	LVDS_BLEN
113	LVDS_A3+	114	---
115	LVDS_A3-	116	---
117	GND	118	GND
119	LVDS_A_CLK +	120	---
121	LVDS_A_CLK -	122	---
123	LVDS_BLT_CTRL	124	---
125	LVDS_DID_DAT	126	---
127	LVDS_DID_CLK	128	---
129	CAN0_TX	130	CAN0_RX
131	SDVO_BCLK+	132	SDVO_INT+
133	SDVO_BCLK-	134	SDVO_INT-
135	GND	136	GND
137	SDVO_GREEN+	138	SDVO_FLDSTALL+
139	SDVO_GREEN -	140	SDVO_FLDSTALL-
141	GND	142	GND
143	SDVO_BLUE+	144	SDVO_TVCLKIN+
145	SDVO_BLUE -	146	SDVO_TVCLKIN-
147	GND	148	GND
149	SDVO_RED+	150	SDVO_CTRL_DAT
151	SDVO_RED-	152	SDVO_CTRL_CLK
153	---	154	---

155	PCIE_CLK_REF+	156	PCIE_WAKE#
157	PCIE_CLK_REF-	158	PCIE_RST#
159	GND	160	GND
161	---	162	---
163	---	164	---
165	GND	166	GND
167	---	168	---
169	---	170	---
171	EXCD0_PERST#	172	EXCD1_PERST#
173	PCIE1_TX+	174	PCIE1_RX+
175	PCIE1_TX-	176	PCIE1_RX-
177	EXCD0_CPPE#	178	EXCD1_CPPE#
179	PCIE0_TX+	180	PCIE0_RX+
181	PCIE0_TX-	182	PCIE0_RX-
183	GND	184	GND
185	LPC_AD0	186	LPC_AD1
187	LPC_AD2	188	LPC_AD3
189	LPC_CLK	190	LPC_FRAME#
191	SERIRQ	192	---
193	Vcc_RTC	194	SPKR
195	FAN_TACHOIN	196	FAN_PWM_OUT
197	GND	198	GND
199	SPI_MOSI	200	SPI_CS0#
201	SPI_MISO	202	GPIO9
203	SPI_SCK	204	MFG_RST
205	+5V <sub>SB</sub>	206	+5V <sub>SB</sub>
207	MFG_TCK	208	MFG_TDI
209	MFG_TDO	210	MFG_TMS
211	+Vcc	212	+Vcc
213	+Vcc	214	+Vcc
215	+Vcc	216	+Vcc
217	+Vcc	218	+Vcc
219	+Vcc	220	+Vcc
221	+Vcc	222	+Vcc
223	+Vcc	224	+Vcc
225	+Vcc	226	+Vcc
227	+Vcc	228	+Vcc
229	+Vcc	230	+Vcc

### 3.2.2 Optional signals

Depending on your Quadmo747-E6xx module, some of the signals indicated on the above table can be absent on the connector.

Signals related to SATA1 Channel will be present only in case Internal SATA Disk is not mounted

#### S-ATA Signals

Pin 30-32: SATA1\_TX+/-: S-ATA Transmit Differential Pair

Pin 36-38: SATARX+/-: S-ATA Receive Differential Pair

### 3.2.3 Specific signals

On Quadmo747-E6xx finger connector there are some signals that are not implemented in Qseven® Specifications rel.1.20, but that don't interfere with standard Carrier Boards.

The following signals differ from the standard:

#### GPIO signals

Pin 91: GPIO5, General purpose I/O

Pin 202: GPIO9, General purpose I/O

These signals are related to Intel® PCH EG20T General Purpose I/O pins GPIO#5 and GPIO#9, and are carried, respectively, on pins dedicated to USB\_CC and SPI\_CS1# signals.

Since these signals are general purpose Input/Outputs, software programmable, they don't cause any kind of incompatibilities with standard Qseven® Rel1.20 compliant Carrier boards.

#### HD Audio Serial Data In 1 signal

Pin 56: HDA\_SD11: HD Audio Serial Data In 1 signal

Intel® Atom™ E6xx series processors have two serial data inputs, while Qseven® specifications contemplate only one SDI signal.

For this reason, in order not to lose the second Serial Data Input offered by the CPU, related signal has been carried out on pin 56, that for Qseven® Specifications is define as a Reserved Pin.

Standard Carrier Boards that leave pin 56 not connected, can be used without problem also with Quadmo747-E6xx board.

### 3.2.4 Considerations about USB signals

According to Qseven® specification, USB port #1 can be optionally used as a USB client or Host port.

Configuration of this port should be made using USB\_ID pin: If the signal is detected as being 'high active', USB Port#1 must be configured as USB Client.

Intel® Platform Controller Hub doesn't have programmable Host/Client USB ports; instead, it makes available 6 x USB 2.0 Host ports and one (fixed) USB Client port.

For this reason, on Quadmo747-E6xx has been used an USB switch.

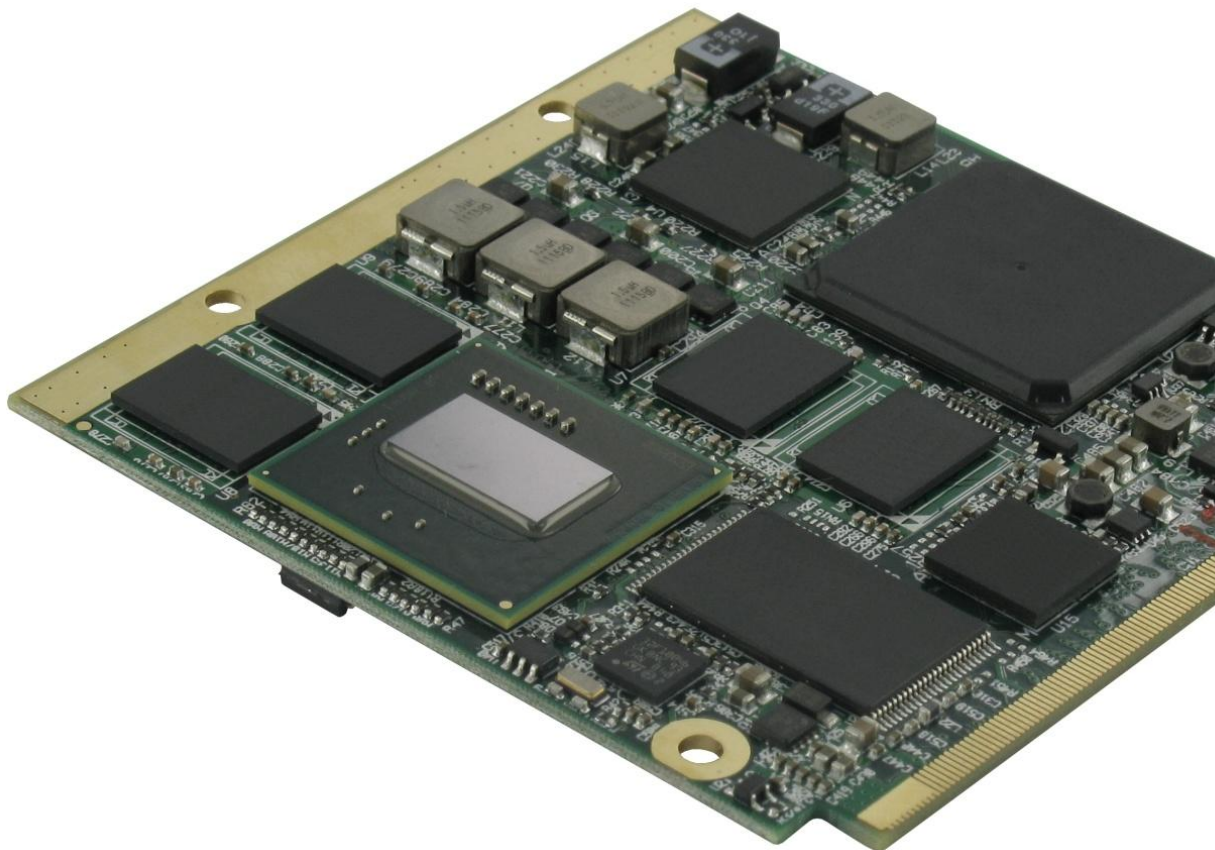
When USB\_ID is detected high, then USB Client signals will be available on USB\_P1+/- pins, and USB Port#1 of Intel® PCH EG20T will be available on USB\_P6+/- pins.

When USB\_ID is detected low, then USB Client signals are not carried to golden finger connector, and USB Port#1 of Intel® PCH EG20T will be available on USB\_P1+/- pins.

For this reason, please be aware that USB\_P6+/- signals (pin 76 and 78) will be connected only in case USB P1 port is used as a client, and USB\_ID is driven high according to Qseven® specifications.

# ***Chapter 4. BIOS SETUP***

- **Introduction**
- **Basic CMOS Configuration**
- **Advanced CMOS Configuration**
- **Chipset Configuration**
- **Power Management**
- **I/O Mapping – IRQ**



## 4.1 Introduction

There are some Quadmo747-E6xx parameters that are important to set after a first board optimisation, until a new change of hardware configuration.

It is possible to get this one using a user-friendly set-up that stores all parameters in an EEPROM: these data are retained also after the board power off.

The access to Setup can be obtained before the bootstrap by pressing *CTRL+ALT+ESC* or *DEL* keys.

Following this operation, it will appear the menu below:

<p style="text-align: center;"><b>SYSTEM BIOS SETUP - UTILITY VERSION 1.05</b> <b>COPYRIGHT(C) 1995-2012 SECO s.r.l. ALL RIGHTS RESERVED</b></p>
<p style="text-align: center;"><b>BASIC CMOS CONFIGURATION</b> <b>ADVANCED CMOS CONFIGURATION</b> <b>CHIPSET CONFIGURATION</b> <b>POWER MANAGEMENT</b> <b>CHANGE SETUP PASSWORD</b> <b>RESET CMOS TO LAST KNOWN VALUES</b> <b>RESET CMOS TO FACTORY DEFAULT</b> <b>WRITE TO CMOS AND EXIT</b> <b>EXIT WITHOUT CHANGING CMOS</b></p>
<p style="text-align: center;"><b>&lt;RIGHT&gt;/&lt;UP&gt;/&lt;LEFT&gt;/&lt;DOWN&gt;/^D/^E/^S/^X/&lt;TAB&gt;/&lt;BACKSPACE&gt;/&lt;BACKTAB&gt; TO SELECT</b> <b>&lt;CR&gt; TO OPEN MENU ITEM, ^Q/&lt;ESC&gt; TO EXIT WITHOUT SAVING</b></p>

Selecting a menu item, it is necessary to use the up and down arrows, while to execute them user must press Enter. The same effect of selecting the last item can be obtained by pressing *ESC*.

First four items allow modifying setup parameters. They will be discussed more exhaustively in the following paragraphs.

Fifth item is used to change the password required to enter into the setup menu (factory default is a blank password, and it can be changed by the final user, in order to prevent unauthorised accesses to this part of the system).

Sixth item restores CMOS situation to last known good values before any parameter modification.

Seventh item resets CMOS parameters to standard values (factory default) that can be adjusted to most probable configuration in order to facilitate the system start in the case of unknown optimised parameters.

The last two items allow exiting from setup respectively updating or not updating the C-MOS RAM. It is important to remember that setup data are stored not only in a C-MOS, but also in an EEPROM.

## 4.2 Basic CMOS Configuration

Selecting this item, it appears a standard setup screen:

SYSTEM BIOS SETUP - BASIC CMOS CONFIGURATION	
COPYRIGHT(C) 1995-2012 SECO s.r.l. ALL RIGHTS RESERVED	
Date (mnth day yr): Sep 13, 2012	
Time (hh:mm:ss) : 16:00:15	
Base Memory kb : 640	
Extended Memory kb: 1038208	
UP/DOWN/LEFT/RIGHT/<CR>/<TAB> TO SELECT	
<PGUP>/<PGDWN> OR +/- TO MODIFY	
<ESC> TO RETURN TO MAIN MENU	

Date and Time fields can be modified choosing the right field with arrows keys, selecting the field with *Enter* or *Tab* and modifying the value with *PgUp*, *PgDn*, + and -.



### 4.3 Advanced CMOS Configuration

After the selection of this choice, it will appear the following table:

SYSTEM BIOS SETUP - ADVANCED CMOS CONFIGURATION COPYRIGHT(C) 1995-2012 SECO s.r.l. ALL RIGHTS RESERVED			
Display tests behaviour	: Enabled	Peripheral reset wait	: 2 sec
Show graphic LOGO	: Disabled	First boot device	: SATA
Ignore IDE 80 cable check	: Disabled	Second boot device	: USB disk
NumLock State at Boot	: Enabled	Third boot device	: USB CD-R
Wait for F1 on Error	: Enabled	Fourth boot device	: None
Ignore keyboard error	: Disabled	User Option ROM	: Disabled
USB keyboard after boot	: Enabled	RAM test execution	: Enabled
SATA AHCI option ROM	: Enabled	COM1 console redirection	: Disabled
<RIGHT>/<UP>/<LEFT>/<DOWN>/^D/^E/^S/^X/<TAB>/<BACKSPACE>/<BACKTAB> TO SELECT <CR> TO OPEN MENU ITEM, ^Q/<ESC> TO EXIT WITHOUT SAVING			

The selections above mentioned are just as an example, they can be different from default values.

Most fields allow two selections:

Disabled / Enabled

i.e., there is only the chance of enable or disable corresponding operations during the system boot.

#### 4.3.1 Display tests behaviour

When “*Disabled*”, it eliminates the message visualisation during initial test.

#### 4.3.2 Show Graphic Logo

This option allows you to enable the visualisation of the graphic logo (a bitmap image 640x480 pixel in 16 colours) during the first steps of boot-up sequence. This image can be customised.

#### 4.3.3 Ignore IDE 80 cable check

When this option is enabled, the system will not perform check of 80-poles cable for IDE Ultra-ATA 133 performances.

#### 4.3.4 NumLock State at Boot

This option allows you to define the *NUMLOCK* state at Boot, delineating working mode of numeric keypad.

#### 4.3.5 Wait for F1 on error

When “*Enabled*”, in case of error during the boot phase, the system halts with the request to press F1 to continue.

#### 4.3.6 Ignore keyboard error

When “*Enabled*”, in case of keyboard error during the boot phase, the system proceeds with the normal boot sequence.

#### 4.3.7 USB Keyboard after boot

During the boot, USB keyboard is always enabled. After this phase, the status of USB keyboard will depend from the settings of this menu item.

#### 4.3.8 SATA AHCI Option ROM

This option allows enabling or disabling AHCI SATA controller (needed both for internal Flash Disk and/or for external SATA Disk).

#### 4.3.9 Peripheral reset wait

This option is very useful for the use of some peripherals, which requires more time after the start-up before that they can grant the access. With this option it is possible to specify how much time must the system wait before to attempt an access to external peripherals, in order to allow their complete reset (possible choices are 0, 2, 4 or 8 seconds).

#### 4.3.10 First / Second / Third / Fourth boot device

This option allows you to choose in which order the mass storage devices have to be searched for a valid O.S. for performing the system start-up. Possible choices for each entry are:

- NONE;
- SATA0;
- SATA1;
- USB CD-R;
- USB disk.
- Int. LAN

Regarding SATA ports, please consider that SATA0 means external SATA Disks, while SATA1 can correspond to internal Flash Disk (if available) or second SATA channel, depending on configuration purchased.

Please also notice that it is not possible to perform the boot from external SATA CD-ROM drives. If you need to boot from CD-ROM, you need to use an USB CD-R.

NOTE FOR BOOT FROM LAN: if you need to boot from LAN, a special procedure to configure the system (Quadmo747-E6xx + Carrier board) properly is needed. Please contact SECO to have detailed information. Please also consider that you have to Disable SATA AHCI Option ROM (see par.4.3.8) if you want to boot from the Network.

#### 4.3.11 User Option ROM

This option allows enabling or disabling any additional BIOS customised by the user, which allows additional features that wouldn't otherwise be implemented in Quadmo747-E6xx module.

#### 4.3.12 RAM test execution

This option allows you to disable RAM test execution during boot phase, in order to allow a faster boot up of the system.

#### 4.3.13 COM1 console redirection

When this option is enabled, all video output is redirected on an eventual serial port COM1 present on the Carrier Board. To work, this serial port must be set at standard address 3F8, IRQ4.

This video output can be read using programs like HyperTerminal or Putty, by setting the communication serial port with the following parameters:

115200bps, 8bit, No Parity, 1 bit stop, No Flow Control.

In case the character set is not visualised correctly, it is necessary:

- on HyperTerminal, in ASCII setup tab, please deselect "Wrap Lines that exceed terminal width" option;
- on Putty, set the "Character set translation on received data" to CP437.

## 4.4 Chipset Configuration

After the selection of this submenu, it will appear the following table:

SYSTEM BIOS SETUP - CHIPSET CMOS CONFIGURATION COPYRIGHT(C) 1995-2012 SECO s.r.l. ALL RIGHTS RESERVED			
Video Boot Device	: PCI-e	PCIE Slot 1	: Enabled
Internal Video Memory	: 64Mb	PCIE Slot 2	: Enabled
Internal Video Boot on	: SDVO	PCIE Slot 3 (Int. Lan)	: Enabled
LVDS panel type	: 800x600@18	INTA IRQ	: 10
High Definition Audio	: Enabled	INTB IRQ	: 11
Default CPU frequency MHz:	1300	INTC IRQ	: 5
Thermal Management	: TM2	INTD IRQ	: 15
SATA Ports Enabled	: Sata0+Sata1		
<RIGHT>/<UP>/<LEFT>/<DOWN>/^D/^E/^S/^X/<TAB>/<BACKSPACE>/<BACKTAB> TO SELECT <CR> TO OPEN MENU ITEM, ^Q/^ESC TO EXIT WITHOUT SAVING			

The selections above shown are an example and they can be different from the default values.

### 4.4.1 Video boot Device

This option allows you to choose which the default video output at system boot is. Possible choices are:

- PCI-e;
- IGD (Internal Graphics Device)

Using this option is possible to set primary video output, if internal graphics card must be used or if primary video output must be directed to external video cards (placed on PCI-express bus).

In case IGD is selected, please refer to "Internal Video Boot on" menu item (see paragraph 4.4.3).

### 4.4.2 Internal Video Memory Mb

This option allows to choose the memory window size reserved for internal graphic controller (possible choices are *OFF*, 1 MB, 4MB, 8MB, 16MB, 32MB, 48MB or 64MB). If there is installed in the system an additional graphic board, it is necessary to set this value to *OFF*.

### 4.4.3 Internal Video Boot on

When Video Boot Device is set to IGD, this option allows to select which Quadmo747-E6xx board's video output must be enabled.

Possible choices are:

- SDVO
- LVDS
- SDVO + LVDS

Note: Quadmo747-E6xx board, like all standard Qseven® boards, has only two graphical interfaces: LVDS and SDVO. SDVO signals are usually converted, on the carrier board, into LVDS, TV, DVI or CRT format. Please check your carrier board's user manual to determine if you are going to use direct LVDS interface or (converted) SDVO interface.

Please notice that using SDVO + LVDS configuration, then primary video output will be SDVO. This means that if you intend to use an LVDS display as a primary video, then, during system boot up, there will not be anything displayed on LVDS screen, until video drivers of installed O.S. becomes operating.

So, if both LVDS and SDVO output are needed, but it is necessary to display something on the LVDS panel during system boot up, then set "Internal Video boot on" to LVDS. O.S. video drivers will be able to manage the dual display in any case.

**NOTICE FOR WINDOWS 7 USERS:** a special notice must be done for users of Windows 7 O.S. that intends to use an LVDS display. In this case, it is important to check the design of the Carrier Board.

If on the Carrier board there is an EEPROM with the adequate EDID for the LVDS, then everything works fine.

In case the external EDID is not present, then Windows 7 will set the resolution to the first panel indicated inside the video driver (usually, 640x480), and it is not possible to change it. Therefore, in that case, it is necessary to build a custom video driver, by using Intel EMGD driver toolkit.

#### 4.4.4 LVDS Panel Type

This option allows defining the resolution and the colour bit depth of video output for the connection of LCD displays (LFP). Possible choices are:

- 640 x 480@ 18
- 800 x 480 @ 18
- 800 x 600 @ 18
- 1024 x 600 @ 18
- 1024 x 768 @ 18
- 1280 x 768 @ 18
- 1366 x 768 @ 18
- 640 x 480@ 24
- 800 x 480 @ 24
- 800 x 600 @ 24
- 1024 x 600 @ 24
- 1024 x 768 @ 24
- 1280 x 768 @ 24
- 1366 x 768 @ 24
- Custom

Custom resolution is a panel resolution that can be customised in Video BIOS. If not changed, this value corresponds to a resolution of 1280x800.

#### 4.4.5 High Definition Audio

This option allows you to enable or disable select the HD audio interface coming out from Intel® Atom™ E6xx CPU.

#### 4.4.6 Default CPU frequency MHz

It allows the selection of default operative frequency (MHz) to be used for the CPU. Since the frequency depends on the processor installed, it is not possible to state here the values that will be offered. CPU frequency, like Thermal management mode, can be varied even by the O.S., according to ACPI tables, CPU C-States and Speed Step management

#### 4.4.7 Thermal Management

This option describes the kind of behaviour that the board must observe in case of processor overheating. Two different types of thermal management are possible, TM1 and TM2, as described in specifications of Intel® Atom™ E6xx processors.

#### **4.4.8 SATA Ports Enabled**

This option allows separated enabling of Sata ports. It is possible to enable only SATA port #0, only SATA Port #1 or both.

Please consider that SATA port#0 is the interface always carried out of Quadmo747-E6xx module, through the golden edge finger, while SATA port#1 can be carried out or used internally for the embedded Flash Disk.

#### **4.4.9 PCI Express Slot 1 / 2 / 3 (Int. Lan)**

This option allows you to enable or disable single slots of PCI Express Bus. Auto option will allow automatic enabling of PCI Express slots in case PCI-e peripherals are found.

Please consider that on PCI Express Slot 3 is placed the internal Gigabit Ethernet Controller. Therefore, disabling PCI Express Slot 3 will result in disabling the Gigabit Ethernet Interface.

#### **4.4.10 INTA IRQ**

This option allows choosing which IRQ has to be assigned to PCI INTA# line (possibilities are IRQ 3, 4, 5, 6, 7, 10, 11, 12, 14, 15 or NO). Please refer to par. 4.6.3 for Quadmo747-E6xx board's internal devices INTx# assignment.

#### **4.4.11 INTB IRQ**

This option allows choosing which IRQ has to be assigned to PCI INTA# line (possibilities are IRQ 3, 4, 5, 6, 7, 10, 11, 12, 14, 15 or NO). Please refer to par. 4.6.3 for Quadmo747-E6xx board's internal devices INTx# assignment.

#### **4.4.12 INTC IRQ**

This option allows choosing which IRQ has to be assigned to PCI INTA# line (possibilities are IRQ 3, 4, 5, 6, 7, 10, 11, 12, 14, 15 or NO). Please refer to par. 4.6.3 for Quadmo747-E6xx board's internal devices INTx# assignment.

#### **4.4.13 INTD IRQ**

This option allows choosing which IRQ has to be assigned to PCI INTA# line (possibilities are IRQ 3, 4, 5, 6, 7, 10, 11, 12, 14, 15 or NO). Please refer to par. 4.6.3 for Quadmo747-E6xx board's internal devices INTx# assignment.

## 4.5 Power Management

After the selection of this submenu, it will appear the following table:

SYSTEM BIOS SETUP - POWER MANAGEMENT			
COPYRIGHT(C) 1995-2012 SECO s.r.l. ALL RIGHTS RESERVED			
ACPI Tables	: Enabled	LID Wake Configuration	: Disabled
Hyper Threading	: Enabled	Power Failure Resume Type	: Last State
SpeedStep	: Disabled	External RTC synchro	: Disabled
C-States Handling	: Enabled	SmbAlert S3 Wake	: Enabled
<RIGHT>/<UP>/<LEFT>/<DOWN>/^D/^E/^S/^X/<TAB>/<BACKSPACE>/<BACKTAB> TO SELECT <CR> TO OPEN MENU ITEM, ^Q/<ESC> TO EXIT WITHOUT SAVING			

The selections above shown are an example and they can be different from the default values.

### 4.5.1 ACPI tables

This option allows enabling or disabling ACPI tables, used in power management from the Operative System to administrate different power states.

### 4.5.2 Hyper Threading

This feature has to be used to enable or disable HyperThreading capabilities of the CPU.

### 4.5.3 SpeedStep

This option allows you to enable or disable Speed Step functionality, i.e. the possibility for the board to vary CPU operative frequency, according to augmented or reduced workload, in order to decrease power consumption when the CPU is not idle.

### 4.5.4 C-States Handling

Use this option to enable or disable the handling of CPU's C-States from the O.S.

### 4.5.5 LID wake configuration

On notebook systems, it is typical that when the notebook is closed, the display is shut down and the system is in a Suspend state. By correctly setting this option, it is possible to specify if the system has to detect a closure event when Lid signal is at High or Low level.

### 4.5.6 Power Failure Resume Type

This option allows you to determine how the board must act after a power failure event: in case the option is "Always ON", the board will start every time the power supply is present; when the option is "Always OFF", the board will not start automatically when the power supply returns.

Finally, with Last State option, the board will remember its state before power failure event. In this way, when power supply returns, the board will start automatically if it was turned on, and will remain off if it was turned off.

#### 4.5.7 External RTC Synchro

Quadmo747-E6xx module has two different RTCs: the first one is integrated into the Intel® Atom E6xx CPU, while the second is programmed inside the embedded microcontroller.

Various O.S. can see just one RTC, so if this option is disabled, then date/time change made in the O.S. will result only in update of internal RTC.

When this option is enabled, then every 8 seconds an SMI will provide to synchronize the external RTC to the internal one.

By entering the setup the synchronisation will be made every 64 ms, independently of the status of this option.

Using an OS with ACPI, independently of the status of this option, each time the system enters S3, S4 or S5 status, then internal and external RTC will be synchronised.

#### 4.5.8 SmbAlert S3 Wake

When enabled, the system will wake from Suspend to Ram (S3) state also with the assertion of the SMB\_ALERT# signal.



## 4.6 I/O Mapping – IRQ

### 4.6.1 ISA Addressing

On conventional ISA bus, addressing space ranges from 00 Hex to 3FF Hex: some of these I/O addresses are occupied by system resources; therefore they cannot be used for direct I/O access.

Please notice, however, that free I/O addresses can change, since PCI dynamical allocation can occupy some of the spaces that are left from BIOS settings. Disabling, via BIOS, some resources can also free some I/O addresses. Finally, additional I/O addresses can be occupied by non-standard devices placed on the Carrier Board of Quadmo747-E6xx module.

Therefore, for an exhaustive list of I/O addresses used, it is better to look into your O.S. Device Manager, to see what addresses are effectively free.

Here following, however, there is a list of addresses usually occupied for system resources.

Device	Range	Note
	0x00-0xFF	RESERVED FOR MOTHERBOARD PRIMARY RESOURCES
IDE1	0x170-0x177	
IDE0	0x1F0-0x1F7	
IDE1	0x376-0x377	
COM4	0x2E8-0x2EF	Available in case the Carrier Board doesn't have SMSC SCH3114 Super I/O controller, able to manage 4 Serial Ports
COM2	0x2F8-0x2FF	Available in case there isn't any Super I/O controller on the Baseboard
IDE0	0x3F6-0x3F7	
VGA standard	0x3B0-0x3DF	
COM3	0x3E8-0x3EF	Available in case the Carrier Board doesn't have SMSC SCH3114 Super I/O controller, able to manage 4 Serial Ports
IDE0	0x3F6-0x3F7	
COM1	0x3F8-0x3FF	Available in case there isn't any Super I/O controller on the Baseboard
	0x400-0x47F	RESERVED FOR MOTHERBOARD PRIMARY RESOURCES
	0x4D0-0x4D1	RESERVED FOR MOTHERBOARD PRIMARY RESOURCES
	0x800-0x80F	RESERVED FOR MOTHERBOARD PRIMARY RESOURCES
PCI / PCIe	0xCF8-0xCFF	PCI configuration register
PCI / PCIe Devices	0x1000-0xEFFF	PCIO BIOS starts to assign I/O resources from 0xFFFF0 downwards
	0x162E-0x162F	RESERVED FOR SUPER I/O CONFIGURATIONS
	0x164E-0x164F	RESERVED FOR SUPER I/O CONFIGURATIONS
	0xF000-0xFFFF	RESERVED FOR MOTHERBOARD PRIMARY RESOURCES

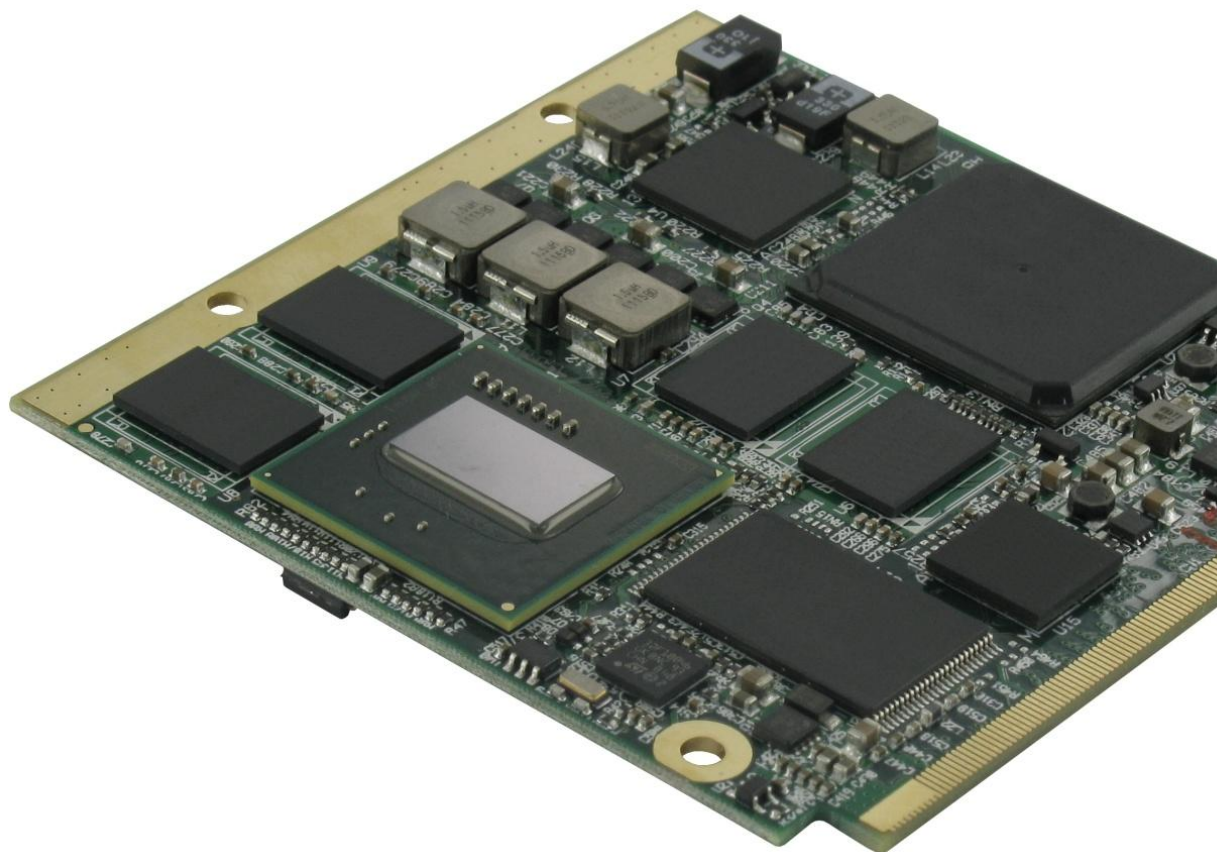
## 4.6.2 IRQ Mapping

IRQ	Device	Note
0	Timer Tick	Timer tick
1	Keyboard Controller	Do not reassign this IRQ to prevent malfunctioning
2	RESERVED	
3	COM2	Available in case there isn't any Super I/O controller on the baseboard
4	COM1	Available in case there isn't any Super I/O controller on the baseboard
5	Available	
6	COM3	Available in case the Carrier Board doesn't have SMSC SCH3114 Super I/O controller , able to manage 4 Serial Ports
7	COM4	
8	Real Time Clock	
9	RESERVED	
10	Available	
11	Available	
12	Available	
13	Math Coprocessor	
14	Available	
15	Available	

## 4.6.3 INTx# Devices assignment

Device	IRQ line
PCI Express ports	INTA#
HD Audio	INTA#
LPC Bus	INTA#
Internal Graphics Device (IGD)	INTA#)
EG20T PCI-e Bridge Packet Hub	INTA#
GPIO	INTA#
USB Host #1 (USB Ports #1, #3 and #5)	INTD#
USB Host #0 (USB Ports #0, #2 and #4)	INTA#
USB Client	INTD#
SDIO	INTC#
SATA	INTB#
DMA #1	INTD#
DMA #2	INTC#
SPI	INTC#
I2C	INTC#
CAN	INTC#
IEEE-1588	INTC#
Gigabit Ethernet	INTD#

# ***Appendix A Thermal Design***



A factor that has to be kept in very high consideration is the thermal design of your system.

Highly integrated modules, like Quadmo747-E6xx module, allow the user to achieve very good performances in a very small space, therefore allowing systems minimisation. On the counterpart, minimisation of IC's and the rise of operative frequencies of CPU's generate a big amount of heat, that need to be dissipated to prevent system hang-off or faults.

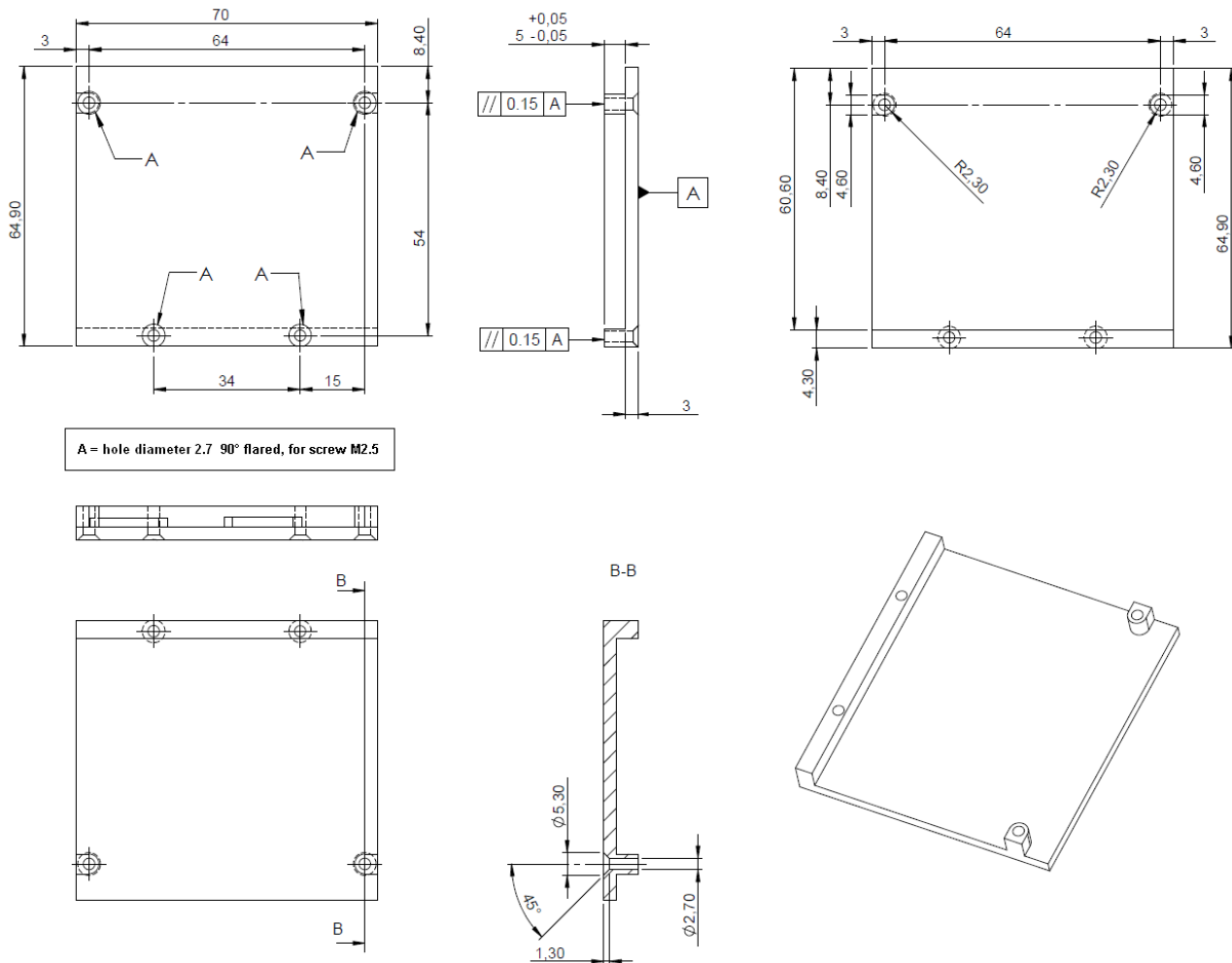
Therefore, it is necessary to study correctly the heat dissipation in your system.

To optimise the dissipation using a board like Quadmo747-E6xx, it is a good idea to use a metallic heatspreader, which contacts directly heat-generating surfaces like the CPU core and the chipset core. Quadmo747-E6xx module, according to Qseven® specifications, have also a metallized strip free of components both on top and bottom side of the module, opposite to card edge golden finger, that should go in direct contact with the heatspreader, to increment the surface used for thermal exchange.

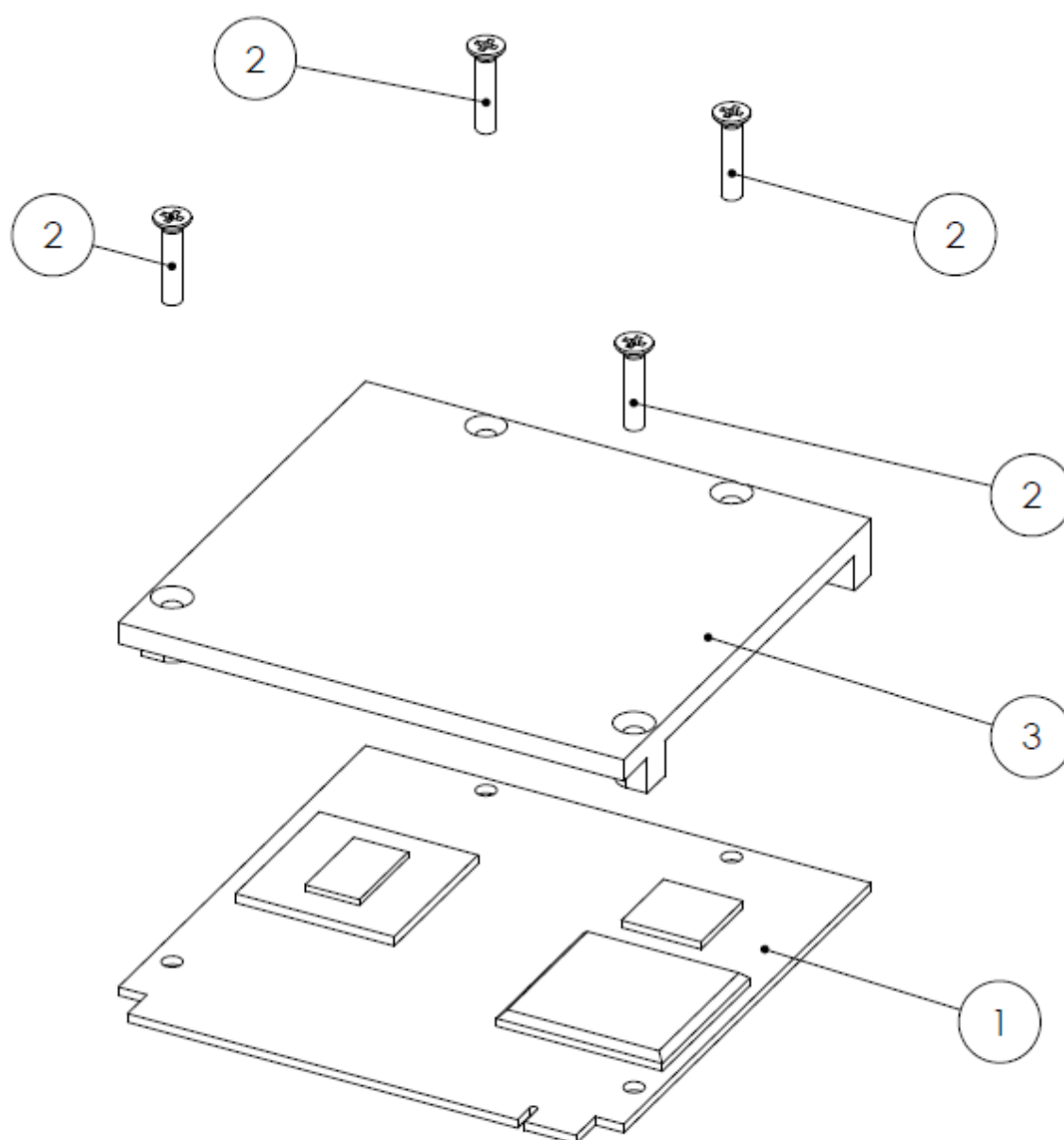
The heatspreader needs to be thermally coupled to the heat generating surfaces using a thermal gap pad, which will optimise the heat exchange between the device and the heatspreader.

The heatspreader, however, acts only a surface that distributes uniformly the heat generated on the board, and could be not sufficient to cool enough the system. Therefore, it is necessary to study carefully the thermal dissipation of your system, and use, if necessary, other additional thermal solutions, like heatsinks, fans, heatpipes...

SECO can provide for standard heatspreaders to use in conjunction to Quadmo747-E6xx module. Please remember, however, that usually these heatspreaders do not represent the complete thermal dissipation solution for your system.



**Heatspreader dimensions and standoff**



Item nr	Quantity	Description
1	1	Quadmo747-E6xx QSeven Module
2	1	Screw, M2.5, cylindrical head, crosshead, L=12mm, Inox A-2
3	4	Heatspreader + Gap Pad Filler assembly

**Heatspreader + Quadmo747-E6xx module assembly**

